DOCUMENT RESUME

ED 131 912 PS 008 837

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TITLE Piaget: A Handbook for Parents and Teachers of Children in the Age of Discovery--Preschool Through Third Grade.
INSTITUTION Mulberry Tree Preschool, Moraga, Calif.
PUB DATE 76
NOTE 61p.
AVAILABLE FROM Victoria Felton, Director, The Mulberry Tree Preschool, 1455 St. Mary's Road, Moraga, California 94556 ($3.70)

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS Classification; *Cognitive Development; Conservation (Concept); Curriculum; *Developmental Stages; *Early Childhood Education; Educational Games; Language Development; *Learning; *Learning Activities; Logical Thinking; Parents; Play; Teachers; Visual Perception
IDENTIFIERS *Piaget (Jean)

ABSTRACT

This handbook, primarily for parents and teachers of preschool through third grade children, provides some insights into Piaget's theories about how children think and learn and presents ideas for using Piagetian-type activities and games in the home or classroom. (The handbook does not attempt to give a comprehensive analysis of Piaget's theory or a complete survey of all Piagetian tasks.) Topics covered include Piaget the man, Piaget's theory, including the stages of cognitive development, the three types of learning (social, physical, and logico-mathematical), and the implications of the theory for education. There are also sections on understanding the preoperational and the early concrete operations child and on the importance of play. Another section includes specific learning activities related to language development, learning through questioning, visual perception and visual memory, premath experience, classification, seriation and conservation. There is a note about how to use and extend the activities, a glossary of terms, and references and suggested readings. (Author/MS)

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PIAGET:

a handbook for teachers in the early years

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PIAGET: A HANDBOOK FOR PARENTS AND TEACHERS OF CHILDREN IN THE AGE OF DISCOVERY

PRESCHOOL THROUGH THIRD GRADE

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CONTENTS

I.	INTRODUCTION	1
II.	WHY PIAGET	2
	Piaget - The Man	2
	Piaget - The Theory	3
	Piaget - The Implications for Education	7
III.	THE AGE OF DISCOVERY	12
	Understanding the "Preoperational" Child	12
	Understanding the "Early Concrete Operations Child"	16
	The Importance of Play	18
IV.	SPECIFIC AREAS OF LEARNING	23
	A Note on Using the Activities	23
	Language Development	23
	Learning Through Questioning	26
	Visual Perception and Visual Memory	29
	Pre-Math Experience	32
	1. Classification	36
	2. Seriation	39
	3. Conservation	41
V.	PIAGET: IMPLICATIONS FOR YOU, THE PARENT AND TEACHER	44
VI.	GLOSSARY OF TERMS	45
VII.	REFERENCES AND SUGGESTED READINGS	51

I. INTRODUCTION

PIAGET: A HANDBOOK has been written primarily for parents and teachers of preschool through third grade children. The purpose is to provide you with some insights into one of the most significant theories about how children think and learn, and some ideas for using Piagetian activities and games in your home or classroom. It is not intended to give either a comprehensive analysis of Piaget's theory, nor a complete survey of all Piagetian tasks. It is hoped, rather, that with the examples included, you, as Parent or Teacher, will be able to elaborate and extend the activities to best meet your particular interests. But, most of all, it is hoped that you will enjoy these early years with your child as he discovers the world around him.

II. WHY PIAGET

PIAGET - THE MAN

Now in his seventies, Jean Piaget, a Swiss Psychologist, is a vibrant, youthful man who has spent more than fifty years observing, studying, and writing about children's cognitive development. He has published 25 books and over 200 articles, and his work has greatly influenced our Early Childhood Education programs.

His studies of cognitive development, thinking, knowing, perceiving, remembering, recognizing, abstracting, and generalizing can help us to understand how our children perceive the world around them at different ages and why they ask questions and interpret information in ways that sometimes seem strange to us as adults.

PIAGET - THE THEORY

During his years of observing and studying children's responses, Piaget discovered many consistent similarities and differences in children's thinking; he built from this a theory of human intellectual development.

The following are some key ideas about how children learn and grow intellectually, according to Piaget:

- Children's "thinking" differs from adult "thinking", not only quantitatively, but qualitatively as well. Children do not simply possess less information than adults, but they process this information differently. In essence, children have different ways of viewing the world and of determining reality.

- Mental development progresses through definite stages and these stages occur in fixed sequence. The sequence is the same for all children, though some may move from one stage to another slightly sooner or later than others. These stages are in a hierarchy, that is, each one is different from the one before, but each incorporates the previous stage. Each stage is also characterized not so much by specific thought content as by a potential way of thinking.

  These stages are:

  Sensori-Motor Stage: 0 to 2 yrs.

  The child relies on touching, feeling, and using his senses to find out about the world. Learning that things continue to exist, even when you can't see them, is an important part of this stage. Piaget calls this "object permanence" and it is the forerunner of "perceptual constancy" in the Preoperational Stage (things are the same even though seen from different perspectives) and "conservation" in the Concrete Operations Stage (things continue to have the same amount, length, and volume, if nothing is added or subtracted but only form is changed).

Preoperational Stage: 2 to 7 yrs.*

This stage consists of two "substages": The pre-conceptual (2 - 4 yrs.), and the intuitive (4 - 7 yrs.). For our purposes, when we refer to the preoperational child, we are referring to the intuitive substage (4 - 7 yrs.).

During both substages, the child still relies on using the senses, but is increasingly able to use language and words to represent things not visible. Thought is egocentric. Not only does the child see things from his point of view, he is not aware that the viewpoint of others might not be the same as his. Furthermore, he thinks that much of what occurs in the world was created for his own purposes and enjoyment! Rather than using logic, the preoperational child reasons and explains events on the basis of intuition or hunches and how things look to him.

Concrete Operations Stage: 7 to 11 yrs.

The child is developing the concepts of number, relationships, processes, and so on. He is becoming able to think problems through mentally, though still in terms of concrete or real objects rather than in abstractions. He is also developing a greater ability to understand rules.

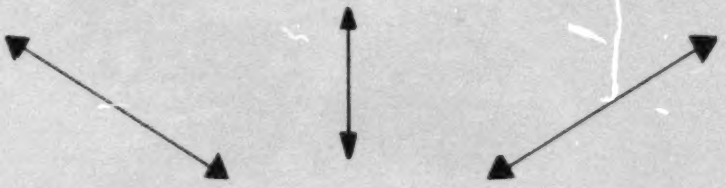
Formal Operations Stage: 11 yrs. on

The child in formal operations is able to proceed a step further; he can now mentally think in terms of concepts and abstractions, rather than relying on concrete or real objects. He can hypothesize and think about what "might be" rather than what "is," and, indeed, seems to form theories about everything. He is demonstrating new understanding of the logico-mathematical and spatio-temporal types of learning. He is reaching the level of potential adult thought. (It should be stressed that most adults do not "think" in a formal operations sense most of the time, rather, the majority of adult thinking is done on the concrete operations level.)

* Although the preoperational stage usually encompasses the ages 2 - 7 yrs., many children are still in this stage at 8 and 9 yrs. The same is true for the concrete operational child, that is, many children do not move to the formal stage until adolescense. The stage of development does not imply amount of intelligence as traditional tests do. It concerns qualitative differences in thinking, not quantitative.

- According to Piaget, there are four interrelated factors which together help a child move from one stage to the next:

MATURATION	EXPERIENCE	SOCIAL INTERACTION
physical and physiological growth, including muscular and nervous systems	sensori-motor input from acting on and thinking about real or concrete objects	socializing, playing, talking, questioning, and working with others, especially other children



EQUILIBRATION

the process of bring maturation, experience, and interaction together to build mental structures or systems for considering the world

- "Operations," according to Piaget, are actions carried out mentally, i.e., "thinking something through." Two important ways in which a child changes in his thought processes as he progresses through the stages are in his ability to understand:

CONSERVATION - The realization that a property such as number, length, or amount remains the same, regardless of changes in shape, position, or the way it is grouped.

REVERSIBILITY - The realization that any change of position, shape, order, etc., can be reversed, i.e., returned to its original shape, position, or order.

- There are three main types of "knowledge"* which traditional teaching has not differentiated, but which require different learning processes by the child. Some aspects can be taught in the traditional sense, but others cannot be taught; they must be discovered and learned through experiencing.

	SOCIAL LEARNING	PHYSICAL LEARNING	LOGICO-MATHEMATICAL RELATIONSHIPS LEARNING
Focus:	Includes: -names of objects -social customs, (manners, rules, dress, morals). -skill learning (spelling, reading, arithmetic). -facts, dates, etc. In short: Things learned by association, rather than logic.	Deals with: -physical world -nature of objects, e.g., to learn that a wheel rolls, what a magnet attracts, what floats, sinks, etc. In short: The child learns about objects by acting on them and observing what happens as a result of his actions	Involves: creating and inventing relationships between objects and symbols. All ways of organizing reality are part of this kind of knowledge. e.g., classifying objects, comparing amounts, comparing sizes, comparing and evaluating different points of view, conservation, one-to-one correspondence, class inclusion, number concepts, and rule learning (ten cups are the same number, even if spread out to cover a wider area).
Role of Teacher:	Requires teaching by others. Emphasis on rote learning.	Requires child having experience with concrete objects. Teachers can provide many opportunities for children to learn by discovery Can be learned verbally and, in some instances, this is more practical, e.g., "If you are hit by a car, you will be hurt."	Cannot be taught by others, because it is not transmitted by simple feedback from people or objects as are social and physical learning. Instead, it is a complex, ongoing process in which the child imposes his present point of view on the problem and integrates his new experiences with his earlier concepts. The child can be trained to respond by rote, but true understanding comes from within the child's own experience.

*See Piaget (1969)

- The stage or level of mental development in effect determines what a child can learn and how he learns.

- Thought comes from actions, not from words. Children, therefore, learn best from concrete experience or from "doing" rather than from "hearing about." This is not to say that a school child should be allowed to experiment on whatever he chooses throughout the day. It is the responsibility of the teacher to provide a setting for meaningful experiences with a great deal of underlying structure to insure progress and order in a child's view of reality.

- As children discover and make sense of their world through experience, they "reorganize" their mental structures, enabling them to deal with ever more complex information. Through "assimilating" or "taking in" of new information, the child "accommodates" or "changes his thinking patterns" to be consistent with new ideas and information.

- The essence of a child's learning about the world is that at each stage of development he actively engages in a construction of reality. This cannot be imposed from without, but must come from within the child. His personal maturation, experiences and social interactions all affect his view of the real world.

PIAGET - THE IMPLICATIONS FOR EDUCATION

Whether your (or your child's) classroom setting is preschool, Kindergarten, 1st, 2nd, or 3rd grade, the theories of Piaget suggest some extremely relevant and significant implications. They provide much of the theoretical basis of both the British Infant Schools or Open Classrooms and the Early Childhood Education Programs in this country. Furthermore, it seems that Piaget's theory of cognitive development, perhaps more than any other theory, will influence the direction of future trends in education for young children.

Since Piaget's theories are not new, one might ask, "Why the current focus of interest?" There are perhaps three main reasons: First, much of what has been written by Piaget and others has been highly technical in nature and difficult to understand and to apply to the classroom setting.

Answering the need for nontechnical interpretation of Piaget's theory, new books, such as this, are being written. Second, Piaget's theory may have had somewhat limited acceptance and application in American education heretofore,

because it does not offer ideas for accelerating children's cognitive development. Third, researchers have recently suggested that it is during early childhood that cognitive growth is more rapid than at any other time in a person's life, and that, in fact, some 50% of a person's intellectual capacity is developed by age 4, and 80% by age 8.* These findings have done much to draw interest to the Early Childhood Education Years!

The theories of Piaget do, in fact, offer some major implications for the Parent or Teacher concerned with educating children during these important years.

If one is interested in teaching children, rather than subject matter, the following implications are especially significant:

1. The importance of seeing what is to be learned from the child's point of view.
2. The understanding that children learn at their own rates and through their own interests and putting this into practice through individualized instruction and learning centers.
3. The teacher's major role should be that of a facilitator for discovery, rather than a dispenser of knowledge.
4. There are some areas of knowledge which cannot be "taught" but must be "experienced" to be learned.

Children view the world differently from adults! The questions they ask and responses they give sometimes seem strange to adults and often provide for amusing anecdotes between parents or teacher and parents. The implication for lesson planning as well as assessing the child's "learning" is evidenced by a traditional Piagetian task in which a number of objects are

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* Report of the Task Force on Early Childhood Education, California State Dept. of Education, Sacramento, Office of State Printing, 1972, p.1.

rearranged so that they take up more space. The adult asks the young child if there are now more objects. To the adult, the word "more" means a larger number or more separate units. But to the child, the idea of "more" means amount of space occupied, so his interpretation will be "Do the objects now take up more space?" and he may well respond to this question instead.

It was precisely these types of answers that turned Piaget's focus of interest to children's thinking. While giving an early form of the now famous Stanford Binet Intelligence Test, he found children of similar ages not only missed the same questions, but, when asked to explain their answers, gave highly similar reasons for answering as they did. The consistency of the reasoning behind wrong answers was (and is) most intriguing!

These observations serve to illustrate the importance of stating the problem or lesson so that it is relevant to the child's point of view and of assessing the child's responses with regard to where he is in his reasoning ability. By accepting his answers, not in terms of right or wrong, but by providing him with opportunities to see the inconsistencies in a concrete way, you, as Parent or Teacher, are encouraging your child's mental growth and creativity.

If children learn at their own rates and through their own interests, as Piaget suggests, it is likely that there will be a variety of developmental rates and interests within any one classroom setting. The implication is clear: teachers must plan and provide a variety of experiences which will meet students' individual needs and modes of learning. The application may be through individualized instruction and "learning centers."

Furthermore, the teacher must understand the role of interest and its relevance in learning. When a child is encouraged to follow his interests, he is involved in the real process of discovering knowledge for himself. In his attempts to make sense of what he sees and to solve the problems he encounters, he is self-motivated to discover or create "answers." *For example, if a child is interested enough in making a "heavier-than-water" object float,*

he will eventually find a way. By placing the one object in another object which does float, thereby causing it to float also, he does indeed discover an old solution which is new to him!

Piaget's theories on how children think and learn suggest an important implication for defining the role of the teacher. Instead of being a dispenser of knowledge, as in traditional school of thought, the teacher should primarily be a facilitator for the child to learn from his own experience. She must, therefore, provide many opportunities for him to act on his environment. Keeping in mind individual differences in how children learn, she must attempt to present "lessons" in terms of what is more beneficial for each child's individual growth. For a child to learn about the basic differences between "roundness" and "squareness" by feeling the objects himself provides a quality of experience that is very different from the teacher giving a verbal lesson on shapes.

There are three main types of "knowledge" which require different ways of learning: Social Knowledge, Physical Knowledge, and Logico-Mathematical Knowledge (see page 6). This simplistic statement leads to consequences which, for educators, are far from simple! The teacher who understands these different areas of knowledge and how they are best learned will vary her presentation of material and teaching according to the area of knowledge the child is dealing with. For all areas though, she will want to provide many opportunities for the child to explore and work with objects in the classroom and to become aware of the effects of his actions on the objects. She will help him to focus attention on the process by asking such questions as, "What do you think happened?" "What did you do to make this happen?" "What is happening now?" and "What do you think would happen if...?" She will encourage the child to think about and to predict what his actions will do and to assess his predictions in terms of the outcome. By encouraging the use of language, the teacher can assist the child to internalize his actions, so that he can think through an action and its consequences, rather than acting first. As Parents or Teachers, we need to understand that a

child who is interested may repeat (seemingly forever) many activities involving the same objects and actions; it is his repeated observations of these reactions that help him to build his understanding.

Although stated earlier that according to Piagetian theory, logico-mathematic knowledge cannot be taught, but must be learned by the child's own integration of experience, we do not mean to imply that the teacher has no role in this area. On the contrary, the teacher serves a vital function by asking challenging questions and by offering both comments and materials to encourage and help the child discover relationships between objects and experience. The adult may also offer vocabulary to help clarify the childs' discoveries. When a child states "It's the biggingest square of all!" a helpful adult, while not contradicting, might offer "largest," "It's larger than the other squares," "The other squares are smaller," or perhaps "It's huge!"

This role, suggests Piaget, is especially crucial during the time of cognitive conflict (disequilibration) when the child becomes aware of inconsistencies and limitations in his own thoughts and attempts to integrate his new ideas. It is this re-integration of his views of reality that leads to a higher level of thinking and cognitive growth.

III. THE AGE OF DISCOVERY

UNDERSTANDING THE PREOPERATIONAL CHILD

Many years of observing and studying children's behavior and responses to questions and problems led Piaget to define four different stages of cognitive development. The late Preoperational Stage (occurring between 4 years and 7 years) roughly coincides with our focus of interest--the preschool through 3rd grade years. These important early childhood years are indeed each child's Age of Discovery and can be our own as well!

Like a child in the Sensori-Motor Stage, a child in the Preoperational Stage still relies on using his senses of touching, seeing, and hearing to find out about his world. There are, however, two major differences: The pre-operational child can now use symbols and language to represent things not present, and he has developed "perceptual constancy." This is the important ability to perceive objects as constant in size, shape, color, etc., even when seen in changing settings which make them appear different.

> *For example, during a Halloween costume party, a 3 year old on the verge of developing "perceptual constancy" seemed puzzled by her teacher, who was wearing a wig. "Are you going to be my teacher again?" she asks. To another child in this same stage of development, a cat may be perceived as a little kitty when up in a tree, and as a big cat when next to him. Many of us also have had the experience of meeting a young child in a place he is not used to seeing us, such as a store. He may watch cautiously and start to say "hello," but seem quite unsure of himself. "Are you _____?" he may ask. "Perceptual constancy" is beginning to be a part of this child's thinking. An older child understands that you are the same person, regardless of where he sees you.*

Despite the important intellectual achievement of "perceptual constancy," the preoperational child reasons and makes explanations on the basis of intuition or hunches and how things look, rather than on the basis of logic. He judges size and other physical characteristics entirely by appearance, even though reason would show the truth to be otherwise. To illustrate, pour all the milk from a tall, thin container to a short, fat one in front of a child and

he is apt to think there is now a different quantity of milk than before. The preoperational child does not reason as the Parent or Teacher that, if nothing is added to or taken away from, then there must still be the same amount. To him, if it looks like more, then he thinks the quantity has actually increased!

The preoperational child is egocentric in speech and thought. He cannot take the point of view of another person; he can only see things from his perspective. Indeed, he is not aware that there might be other points of view. Piaget illustrates this egocentrism by placing a scale model of three mountains of different heights between a child and a doll. He then showed the child pictures of the mountains from different perspectives and asked the child how the mountain might look to the doll. A child in the preoperational stage is unable to do this--he simply has no idea that there is a viewpoint other than his own.

Another clear example of egocentrism with which all parents empathize at one time or another is the amazing ability of the child to think that much of what occurs in the world was created for his own purposes and enjoyment!

> *For example, "God made this hamster for me to play with." "A tree is to climb." "It snows so that I can build a snowman."*

The thought of the preoperational child is further characterized by:

OVERGENERALIZATION - he has difficulty making differentiations between items in a class. *For example, calling the plumber, the mailman, and the next-door neighbor "Daddy."* Overgeneralization occurs primarily in the early preoperational stage.

OVERDIFFERENTIATION - he has difficulty making appropriate generalizations to items in a class. *For example, "I have a brother and a baby, but he's growing up to be a brother too!" Another child may deny that "Fluff" (his cat) is a member of the cat family, because "Fluff" seems a special case to him.* Overdifferentiation primarily occurs in the later preoperational stage.

PARTICIPATION - he believes he can participate in and control nature. *For example, "Rain, rain, go away."*

ANIMISM - he believes the world of nature is alive and that everything is endowed with conscious purpose. *For example, "The clouds are alive, because they move." "Teddy (bear) will be cold and scared if we don't find him and he stays outside."*

ARTIFICIALISM - he believes that human beings created natural phenomenon; that man made the mountains (perhaps as a place to go camping).

Two other important aspects of how the preoperational child thinks are his use of transductive reasoning and centering. He relies on transductive reasoning, i.e., reasoning from particular to particular to explain events rather than using inductive or deductive logic.

> *For example, Jennifer (age 3 1/2) playing with an older child-- "I have to go to the store because I need to make dinner." Off she went to the pretend store, returning in a few minutes. "I have to dig a hole because I need to put water in it."*

Jennifer has tied events together on the basis of her experience, rather than by the use of logical connections.

When a variety of attributes are presented in a situation or object, the preoperational child tends to center or focus on only one of these. Similarly, when two changes take place at the same time, the preoperational child centers his attention on only one, ignoring the others. To illustrate this characteristic of centering, Piaget took two balls of clay and rolled them to make equal balls. When the child was satisfied that the two balls were alike, Piaget then took one and rolled it into an elongated sausage shape while the child watched. Was there now more clay in the sausage, less, or the same amount as in the ball? Piaget found that children in the preoperational stage usually said there was more in the sausage because it was longer. Having not yet developed a concept of conservation of quantity, the preoperational child bases his judgment on how something looks. He cannot think simultaneously

about changes in width and length and his answer will depend on whichever dimension has caught his attention.

Because the thought of the preoperational child from 4 years to 7 years of age tends to be egocentric, centered, based on visual perception and intuition and characterized by reasoning from particular to particular, rather than inductive or deductive logic, he has great difficulty:

- understanding conservation - that amount, length, or weight remains the same if you only change form.
- understanding reversibility - when a puzzle piece is taken out and turned slightly, he will think it no longer fits, or grandmother in a new hat is not the same grandmother he knew.
- expressing the order of events.
- explaining relationships, especially cause-effect.
- understanding numbers and their relations.
- understanding other speakers accurately.
- understanding and remembering rules.

The "thought" of the preoperational child is indeed different from that of the adult! One of the most interesting and important things a Parent or Teacher can gain from studying Piaget is an ability to listen to what children are saying, not just to hear the words. Taking an example of animism, when a preoperational child remarks that a car is alive when you drive it, his statement may be dismissed by an adult who assumes he lacks "knowledge." For a listening adult, further inquiry might reveal that *"A clock is alive when it ticks," "A house is alive because you live there," and "My Teddy bear is alive because he loves me."* These statements are not due to a quantitative difference in intelligence, but a different and very valid (to the child) logical system he has worked out to make some sense or order from his world. To continually suggest to the child operating at this level that what he says is not so, serves no purpose and may even have a detrimental

effect. He is trying to form a logical system, and to downgrade his efforts as worthless may make him less ready to share his thoughts again, and may even discourage his interest in understanding the world.

UNDERSTANDING THE CHILD IN THE EARLY CONCRETE OPERATIONS STAGE

Since our focus of interest in Early Childhood Education includes Kindergarten through third grade, it is appropriate at this point to discuss the child in transition and the child who has reached concrete operations. It is important, though, to keep in mind that some children in third grade are still in the preoperational stage, while some in second grade are already in concrete operations. For learning to be most meaningful to each child, you, the Parent or Teacher, need to accept these individual differences and "meet" the child at his own level of development.

In essence, the child in the concrete operations stage can now differentiate between appearance and reality. He does not rely on "how things look," as did the preoperational child, for his explanations and answers. He is becoming able to think things through mentally, although still in terms of concrete or real objects, not abstractions. His thought is becoming less egocentric and more decentered, and he is beginning to:

- understand conservation - objects or quantities remain constant, despite changes in their appearance (*e.g., one cup of milk is the same amount, whether poured into a tall, thin glass or into a short, wide glass.*)
- understand reversibility - the ability to mentally reverse an activity and go backwards in thought in order to coordinate previously observed phenomena with present circumstances (*e.g., if 2 plus 2 make 4, then 4 less 2 leaves 2 once again.*)
- express the order of events.
- explain relationships, such as cause-effect
- understand numbers and their relations
- understand other speakers accurately
- use language for planning
- understand and remember rules and to play complex games cooperatively.

Childrens' Play

Do you remember....

making mud pies and sand castles?
climbing trees?
having a secret hide-out or clubhouse?
cuddling a baby doll?
enjoying a tea party?
dragging a stick along the ground?
digging a sand tunnel?
following a snail's trail?

If you do, then you will understand how it is -- children have a vital need to play.

Through play, they learn to function as unique individuals and find joy in doing things well.

Through play, they discover what "is" in the world around them.

Children are minds and muscles. Both must be exercised. As children play, they act upon objects in the world around them. They respond to the actions of others. Doing and thinking become related.

The faces of children at play are alive and intent!

THE IMPORTANCE OF PLAY

The term "play" seems to have taken on a somewhat negative connotation in this day and age. We, as Parents and Teachers, are sometimes afraid that if a child is playing, he isn't learning. To believe that these activities are mutually exclusive, that only one can occur at a time, is indeed an error. Both Piaget and Montessori strongly stress the importance of play in the child's cognitive, social, and psychomotor development. As Montessori implies, "Play is the child's work." *

Piaget differentiates between "imitation" and "play." In imitation, the child seems to be making a serious effort to accommodate himself to new objects and activities. In role-playing or pretending to be "Father," for example, the child is trying out what that role might be like. He is learning self-identity by imitating and experiencing. In play, however, the child is not making an effort to accommodate himself (change himself) to reality, he is, instead, assimilating objects and activities to his own satisfaction. He may build with blocks, create a new game, move the vehicles in a race, or explore and experiment with objects (magnets, counters, different textures, etc.). To the casual observer, the child may seem totally involved in playing and not learning. To the aware observer, the child is involved in developing oral language, listening skills, social skills, concepts of spatial relationships, conversation, classification, seriation, math readiness, etc.

Cooking is an activity which is often thought of as "play" for two reasons: First, it provides a great deal of enjoyment for preschoolers and primary grade children; and, second, it does not <u>seem</u> to fall into the "academic" category. Cooking provides experience in seriation or understanding a sequence of operations and events; "first you do this, next step is..." as well as in measuring, understanding changes that occur in texture, size, taste, etc. due to changing the temperature. It is really a combined science,

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*Montessori, 1949; Standing, 62.

sensori-motor, eye-hand coordination, visual perception, pre-reading, pre-math, language development and social interaction experience--to say nothing about its positive effect on the child's emerging self-concept ("I made it myself!") and the fact that it's just plain fun! Page 22 illustrates some types of learning from one such cooking experience.

While play provides opportunities for many types of learning in the young child, the most important, according to Piaget, is play's crucial role in developing representational language and thought. It is essential! The child progresses from practicing sounds he accidentally makes and imitating sounds he hears to the point where he begins to say "words." The child then moves into a period where "ludic symbolism" emerges--where an object becomes the symbol for something else which may only resemble it remotely. Piaget feels that representational thought develops from these non-verbal symbols which emerge at the end of the sensori-motor stage, not from the incorporation of verbal signs (the learning of words) from the social environment. Between the ages of 2 and 4, symbolic play and language development are at their peak, *e.g., the child pretends to eat imaginary candy and offers the adult some, pretends to sleep and to put dolly to sleep, has imaginary friends who carry on involved conversations, etc.*

Gradually, play comes closer and closer to the imitation of reality and it becomes increasingly social. As the child accommodates better to the outer world, he has less need to assimilate reality to his distorted view. Assimilation and accommodation gradually converge until, for the well-adapted child, play is no longer very different from intellectual activity. There is a transition from symbolic games to spontaneous, creative ability.

For the Parent or Teacher concerned with a child in the Age of Discovery, the implications are clear--to provide many opportunities for "ludic symbolism" or make-believe play and to understand the important function these activities play in the child's development while continuing to offer a model which represents reality.

When the opportunities for play are presented, how can the Teacher or Parent expand the learning potential of the situation? What concepts, what language, what focus should be used to promote learning? The following example of childrens' play might occur in your classroom or at home with blocks. Some of the comments may be those of children; other comments might be suggested by the Parent or Teacher.

"This block is square." -- labeling, mathematical concept

"You've used all rectangles in your building." -- classifying by shape, labeling

"Can you find another block just like this one?" -- matching, classifying by size and shape

"Let's see how many round blocks we can find." -- labeling, number concepts, classifying by shape

"How can you make this road as long as that one?" -- language development, measurement, defining spatial relationships, problem solving

"Do you think this truck will fit through your garage door?" -- language development, size discrimination, spatial relations.

"What do you suppose would happen if you put this block here?" -- experimentation, testing

"How can we connect these two blocks?" -- problem solving

"When you put these two triangles together, they look like a square." -- mathematical concepts, language development, experimenting

"Which block feels heavier? Do these blocks weigh the same?" -- weight concepts, language development

"Let's put the big blocks on the shelf." -- classifying by size and shape

"This isn't a big block. It isn't a square block either." -- concept of "not" in classifying

"Could we build a house with round blocks?" -- hypothesizing, problem solving, experimenting

(To a child who has built a house with no doors or windows), "How will the people get into your house?" -- language development, problem solving

"Which is the shortest way from the house to the store?" -- measurement, spatial relationships

"Will the car go under the bridge or over the bridge?" -- language development, spatial relationships, prepositions

"What would you do if the road were closed?" -- problem solving, verbalizing alternatives, experimenting with ideas

"You made it balance here, can you make the other side balance?" -- language development, structural relationships

"Will it fall down if we put this big block on top?" -- concepts of balance, gravity, relationship of base to height

"My foot is 3 blocks long, how long is your foot?" -- concepts of size, numbers, measurement

"Billy's road has a pattern. Let's make one that has the same pattern."-- discrimination, sequencing, imitation

"How will the car (or animal, horse, person, etc.) go up (or down) the ramp?" -- language development, concepts of force, gravity, motion.

This brief example* illustrates the questioning which can be used to promote learning. The next example suggests the scientific concepts which can be developed through learning to make vegetable soup.

In both of these so-called "play" experiences, the child is learning problem-solving skills, language development, spatial relationships, temporal sequencing, structural relationships, logical thinking, as well as mathematical concepts of measurement, comparison, size, number; and scientific concepts of gravity, force, motion, heat changes, cause and effect relationships. Both examples illustrate the rich opportunities for learning while playing!

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*Adapted from "Teaching Children as They Play" by Dorothy Amber, Jackie Foster, Joan McLane, Joyce Sobel, and Bernice Weissbourd. Young Children, May 1974, pp.203-213.

SCIENTIFIC CONCEPTS DEVELOPED IN A COOKING EXPERIENCE

Activity	Facts Learned	What Child Is Trying To Do	Concept	Some New Words
Vegetables are: weighed washed scrubbed sliced cubed popped-open shredded peeled scraped sampled Count peas in the pod	Name of vegetables How different vegetables grow Notice the root and stems Taste and smell new vegetables Textures Watch for discoveries by the children: "This onion makes me cry!" "It's wet inside."	Classifying, compare Notice differences Satisfy curiousity Experiment	Weight Variety Color Texture Shape Cause and effect	Squash Pod Shred Root Vegetable Peel Slice Ounce Pound
Vegetables are put into pot with water, seasoning, beef bone or bouillon, and placed on stove	Sources of heat Danger of heat--"It's hot!" Rising and spreading of steam (vapor) Boiling makes bubbles	Discriminate Become competent Assimilate facts Observe Satisfy curiousity	Change in matter: liquid solid vapor Cause and effect	Liquid Solid Evaporate Steam Boil Vapor
The soup is eaten--right away or the next day	Vegetables are now soft Taste and smell are changed due to cooking and seasoning	Enjoy pleasures of eating Discriminate: Taste Colors Textures Temperatures	Change: due to heat: Hard to soft Cold to hot Use of plants by humans	Broth Temperature Cook Flavor

IV. SPECIFIC AREAS OF LEARNING

A NOTE ON USING THE ACTIVITIES

With regard to the activities suggested, the main purpose is to give each child firsthand experiences which will provoke thinking. Begin with the simplest activities first and, when a new experience is introduced to the child, begin with only one variable. Then expand, add variables, add complexity--let your child think for himself. Give him plenty of time. If he seems frustrated or uninterested, lay the activity aside for now. Let your child perform whatever actions are called for, *e.g., pouring, sorting, etc.* Let him do it even if he spills or takes a long time. Continue the games and activities only when they are fun for both you and your child. Remember also that your child may want to continue an activity after you are "bored" with it. It is through this exercise that the child is able to refine and vary his forming concepts. Don't rush him on to a new activity because you feel he should have "learned it" the first or second time presented. Allow plenty of time for this process to occur!

The activities that follow in each section are very basic Piagetian learning experiences. Some of them can be simplified for younger children, some can be made more complex for older children. These activities are only meant to be examples of a whole set of activities in each area that you might think of. Use your imagination to think of others, adapt these to suit your own child (children) better.

LANGUAGE DEVELOPMENT

One of the most important types of learning that takes place in the preoperational stage is language development. A child moves from the vocalization of the sensori-motor stage to the verbalization of the preoperational stage. His verbal language now contains two components: Communicative speech and Egocentric speech. Communicative speech serves the purpose of transmitting information or asking questions. Egocentric speech, often interpreted as serving no purpose

other than pleasure to the child, has a different function and one of vital importance in the child's development. Communicative speech is a means of social interaction; one of the four interrelated factors in mental development, according to Piaget, while egocentric speech may be described as a monologue; the child talks as he plays, often verbalizing what he is doing.

> *For example, a 3 year old boy was observed working alone at a table using a larger baster to transfer water from one bowl to another. As he would squeeze the baster to release the air, he would say to himself, "Make the bubbles!" Then filling the baster with water, he would say, "Fill it up to the top...up to the top. Now carry it over," carrying it over to the other bowl, "and squish," squirting the water into the bowl. He repeated the actions accompanied by speech until the first bowl was emptied. Then he said, "It's through" and placed the work back on the shelf.*

We suggest that this serves an important function--that of attaching the verbal signs (words) to the actions and concepts the child is working with on a sensori-motor level. Language will assist here in his efforts to internalize these actions so that he moves forward in his developing ability to deal with them in a more abstract way.

Language helps a child to organize his thinking, is a tool for internalizing experience, and frees the child from the need to experience everything at a physical level. It essentially bridges the gap between action and thought. Although egocentric speech may comprise as much as 40% of the total talk of children in the preoperational stage, we feel it is serving an important function and should not be discouraged.

Components of Preoperational Speech

	COMMUNICATIVE	EGOCENTRIC
Purpose	Serves to transmit information, ask questions.	serves to attach verbal signs (words) to actions and concepts.
Means	Dialogue with social interaction.	Monologue with social interaction.
Amount	May be approximately 60% of child's verbalizations.	May be approximately 40% of child's verbalizations.

A Note About Arguments

Since the preoperational child does not yet fully differentiate between words, things, acts or events, arguments are likely to occur. As parents and teachers have observed for years (perhaps centuries!) the arguments between young children tend to be vigorous statements of conflict. There seems to be little interest in persuading or convincing the other using reason. Remember, too, that a child in this stage only sees things from his point of view. Arguments are, in fact, understandable as they occur from the child's egocentric thought and speech.

A Note About Lying

Just as arguments are likely to occur because the preoperational child does not yet fully differentiate between words, things, acts or events, "lying" is common to almost all children at this age. We, as adults, might keep in mind that perhaps "lying" is not the correct term, as the child is not purposely trying to deceive. Rather, the facts may be mixed up in his mind or he may still have trouble differentiating fact from fiction, or the story may just sound better that way, or he may want so badly to have the same experience or object that he believes talking will make it so. Also, because the preoperational child sees things from a very different point of view than we do, he may, in fact, be reporting an event in a manner that seems "true" to him, however

inaccurate it may seem to an adult. Every parent has surely had experience with a child who reports a monster in his room at night!

More about language development may be found in *"THE IMPORTANCE OF PLAY,"* and *"LEARNING THROUGH QUESTIONING"* sections of this book.

Activities

- Role-playing and games like "Let's Pretend"

- Make a book with your child. Have him dictate as you write the story. He can then illustrate the pages. Make it really special by putting the title he chooses and his name as author on the cover. You may want to make a scrapbook with pictures taken of a trip or excursion and have him dictate the story to you. This also helps with sequential progression.

- Block play, role-playing, any activity where cooperative effort is important can serve as rich opportunities for language development.

- Have child dictate letter to Grandparents, friend, etc.

- Cut out pictures from magazines and have young child tell about them. An older child may cut them out himself and make a collage or scrapbook. Encourage him to tell a story about the pictures.

- Play guessing games. "What animal am I thinking of?" You give description: "He's very big, grey, has floppy ears, big feet, and a long trunk." This is a good game when waiting for an appointment or driving a car, or in a classroom setting to have a group of children play among themselves.

LEARNING THROUGH QUESTIONING

The question "Why?" in response to almost every request or remark is an all-too-familiar one to the parent or teacher of the young child. Piaget suggests when the child is 3 or 4 and starts asking "Why?" his questions should be taken seriously. He cautions not to give immediate answers, but

to use your child's question as a starting point for exploring an idea. Turn the "Why?" around, "Why do you think?" Our role, then, is to encourage the child's spontaneous development on one hand, and to serve as an adult guide on the other hand. To guide does not mean to provide ready-made knowledge or solutions; it means to create situations in which the child can work and learn by himself and for himself. (Elkind, 1970)

Many of Piaget's studies and observations have been done in the inquiry method and this has definite application in the educational setting. His theory suggests that children at different ages differ in their cognitive development, not only quantitatively, but qualitatively as well. Therefore, they will respond to questions differently at different ages; although there will be a definite similarity between the way preoperational children answer questions. Again, while we stress that Piaget does not suggest accelerating cognitive development as beneficial, his theory seems to indicate that a child who is on the verge of moving from one stage to the next may be facilitated in doing so by questioning. Questioning or "contrepreuve" (examples offered which are counter to the child's suggestions), according to Piaget, serves to produce disequilibration, that is, the child senses that perhaps what he believes may not always be true. (Elkind, 1972) He experiences cognitive growth as he assimilates and accommodates new information.

Activities

Ask:

"Why do you suppose this happens," or "What do you think would happen if...(the sun went out, the rain didn't fall, etc.)." This may sound very much like your child's "Why" questions and you may be able to help him think out the answer by responding with a "Why do you suppose" answer.

Class Inclusion Questions:

"In all the world, do you suppose there are more dogs or more animals?" (The preoperational child of 3-5 will usually focus on one attribute and can be helped to see that a dog is an animal, but so is a cat, horse, etc., so there must be more animals.)

Logic Questions:

"Do you know what it means to be alive?"

"Are you alive," dog, cat, tree, bird, rock, clouds, sky, etc. The preoperational child will usually have one attribute that to him makes things "alive," *e.g., it is alive because it moves.* He may then apply this logic and say that clouds, rain, clocks, etc., are alive. It is more probable that he is not totally sure of his theory and can respond to some correctly, some incorrectly. He is experiencing "disequilibration," which Piaget stresses is important for "learning." The child may sense that even though clouds, rain, and a clock move, which he said signifies being alive, they are not really alive, so there must be another reason why they move. When asked "Why?" he probably will respond with "because" or "I don't know" because he has not fully developed this new theory.

"Do you think there are other children named Michael?" (or whatever the child's name is)

Preoperational children may answer "yes" if they have, in fact, had experience with others with the same name and have incorporated into their cognitive structure that a name is not part of the object, but is a label given (by society) to help differentiate from other similar objects or beings. Others who have not had experience with names may, in fact, believe that there can only be one "Michael" because it is born with them and is a part of them. (An example of egocentric thought characteristic of early preoperational stage.)

Let's Predict and Then Find Out Game

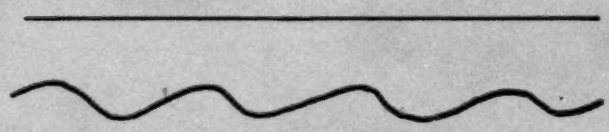
Ask your child the following questions (and make up some of your own) and then proceed to find out!

- What happens if I put salt in water? (dissolves)
- What happens if I put a rock in water? (sinks, doesn't melt)
- What happens if I drop a cork in water? (floats, doesn't melt)
- What happens if I hold a feather in my open hand on a windy day?
- What happens if I hold a rock in my open hand on a windy day?
- What happens if I stick my hand in a bowl of water?
- What happens if I push a swing forward?

VISUAL PERCEPTION AND VISUAL MEMORY

The preoperational child relies heavily on how things look to him to supply him with answers. Vision is the main sense used in this stage, whereas touch and taste were predominant in the sensori-motor stage.

Activities



"Which line is longer?"

A preoperational child will usually focus on the ends of the lines to answer this question. He may say either is longer, depending on which attribute he is focusing, and then say "I don't know" in response to "Why?" If you ask, "I have two mice (draw at ends of lines) and they start a race and run to the end of their lines, which one will get to the end first, or will they both get there at the same time?" A preoperational child may answer the one traveling on the wavy line. "Why?" "Because it's curvy and he might fall and that would take longer." He is not able to see that the wavy line is longer because he can see that both lines start and stop at the same place.

"What's Gone?" (visual memory game)

Place a few (increase number) objects in front of the child, ask him to close his eyes, while you remove one object. He must then identify which has been removed. A child in the preoperational stage (4-5 yrs.) can play this game with simple, familiar objects. An older child can use the same recall game with increased complexity.

"What's In a Picture?"

Give child/children a few moments to study a picture. Then turn the picture out of view and ask them questions about it.

"Guess What's In The Bag?"

A good game for traveling or visiting. Take a cloth bag with ribbing around the top, put in an object and let the child guess what it is from touching.

A caution: Piaget suggests that haptic-visual cross-modal transfer (i.e., transferring touch clues to vision) occurs on the average between 5-7 yrs. or late preoperational stage, so it would be well to use familiar objects in the "Guess Bag" or let your child experiment with his own objects that he can touch but not see.

Match Games

Any type of game requiring the child to visually match color, shape, pattern to another item or items. For instance, from scrap materials, cut two pieces alike, mount them on cards and let the child match.

Lotto Games

Alphabet Match

For children ready to learn the alphabet, use a poster board divided into sections; each section has a different letter of the alphabet on it. On small cards, the size of each section, print the letters to match. Make up several master cardboards with different letters, different order of the alphabet, etc.

Poster Board

a	b	m	p	l	f
r	s	e	j	t	k

r

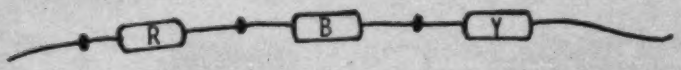
You can do this kind of task with other things--pictures of food, plants, people, numbers, colors, etc.

Beads and Tube - (visual memory)

You can make this game using:

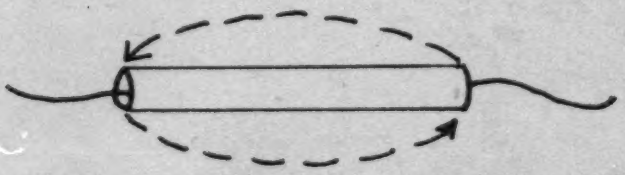
3 different colored beads or spools of thread
string
cardboard tube from paper towels

Tie beads on string with a knot between each bead to keep them separate.

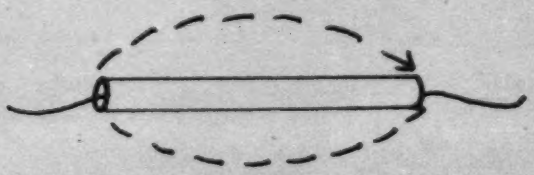


With child, pull the string slowly through the tube. Tell the child to watch. When all the beads are hidden, ask the child "If I keep on pulling the string, which bead will come out first?" Then let the child pull the string, but only until one bead comes out. Have the child look. Pull all the beads back into the tube and ask the question again. Repeat, ask which will come out second, which last.

If the child is more advanced, pull the string until all the beads are hidden, then rotate the tube 180° and ask which will come out first.



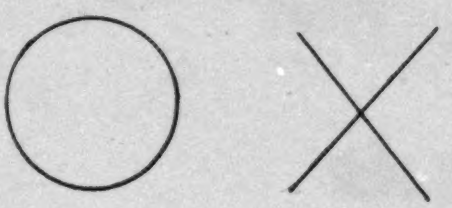
Then rotate the tube 360° and ask which will come out first. Let the child experiment with this on his own.



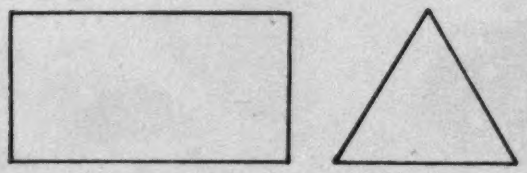
PRE-MATH EXPERIENCE

Piaget suggests that the spatio-temporal learning, which is essential for the later development of math, science and logic, begins in the preschool child and at the sensori-motor stage with large body movements. Logico-mathematical and spatio-temporal learning cannot be "taught" in the traditional sense by others, but must come through the child's own experience with objects (learning by discovery) and the resulting integration and reorganization of ideas by the child. The type of learning includes: spatial relations, time concepts, number concepts, one-to-one correspondence, classification, seriation, conservation, etc.

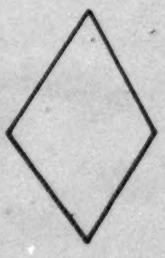
With regard to spatial relations in math, Piaget finds that at approximately age 3, the child begins to understand topological concepts on which simple geometry is based. A child will understand and be able to respond with drawing open and closed objects.



Euclidian geometry, however, is based on projective ideas and requires an understanding of angles and shapes. At around age 5, the child begins to develop this understanding and can conceptualize and draw these shapes.



However, it is usually not until after age 7, that a child can draw a diamond.



Number concepts are another important aspect of this spatio-temporal learning and number readiness, and are far more important than rote arithmetic. We, as adults, take for granted certain underlying facts about numbers. *For example, that the number of objects remains the same, even if they are arranged in a different way.* This is not so for the preoperational child. He does not comprehend this.

It is important, therefore, to provide as many opportunities as possible for the child to work with numbers in order for him to develop a true understanding of number concepts. Unfortunately, with many parents and teachers, the only step for teaching number concept that has been consciously taken is to teach the child to count, and counting by rote, i.e., reciting the names of the numbers in order, has little to do with meaning! In fact, one often finds children who can say the numbers in a rising scale, as presented on Sesame Street, but cannot repeat the numbers in an even tone.

Piaget has found that counting was of surprisingly little help to the pre-operational child in finding out whether two groups have the same number of objects. He observed that children could count the same number of objects in each row, getting 7 both times, and still say there were more in the longer row, if it were more spread out! Seven was just a name to them, not a concept. It did not convey the idea that the two groups had an equal number just because they were both named seven.

As suggested in our earlier discussion of the preoperational child, and as illustrated in this experiment, the child in this stage does not take into account the spaces between objects, but judges by overall appearance. Seven objects spread out over a wide space seem to him to be more than seven objects clustered together in a small space. He does not yet understand that "seven-ness" is preserved throughout all changes in an arrangement. Until he develops this concept, he cannot really grasp the meaning of number, although he may have memorized the number names.

Even a child who can count to 20 may not be reasoning according to adult logic. An interesting experiment to try is to present two unequal groups of buttons, chips, or whatever; 10 in one pile, 20 in another. Ask the child to draw one button from each pile to make two equal new piles of 8 each. Are the new piles equal? Do they have the same number? Some children will say there are more buttons on the side drawn from the larger pile, even though they have just counted equal numbers into each pile. They are operating as if "moreness" transfers!

Don't let your child's ability to count mislead you into thinking he understands numbers as you do. It is probably true that saying the names of the numbers in order has about the same relationship to mathematics as saying the alphabet has to reading!

At this point, you may well be asking, "How does a child understand the concept of number?" Children, as we said, can be taught to count, but the true understanding of number is something they must develop for themselves out of their own experience. This ability to deal with numbers is really a bi-product of two prenumber activities: Classification and seriation. A number involves classes (classification) in the sense that it represents a collection of objects (cardinal property of numbers). It involves seriation, in the sense that it is ordered in relation to larger and smaller numbers (ordinal property of numbers). A true understanding of number depends, first of all, on the development and integration of these two logical operations.

In addition to classification and seriation, another prenumber idea of importance is one-to-one correspondence, which is actually a way of being sure that two groups have the same number without counting. Before he develops this concept, the child's ideas about number and quantity are all jumbled together into one vague idea of amount. To illustrate this, line up a row of buttons (or bottle caps) on the table and ask your child to make another row with the same number of buttons as yours. Younger children tend to make a row whose end points roughly coincide with yours, but which may contain more buttons because they are crowded together, or fewer because they are spread

out. As mentioned earlier in this section, preoperational children believe the number is the same if the rows are the same length. At around 5 or 6 years, the child will probably think of using the familiar "one for you, one for me" method and make his row by laying one button opposite each of yours.

The child is now sure that he has the same number, but has he really attained one-to-one correspondence?

If you now take one row and move the buttons to make a pile, the child may now say the pile has more buttons. Not until he becomes a conserver of number, which Piaget placed at about 6 or 7 years. does he grasp the essential idea of number, i.e., that the number of objects in a group remains the same, no matter how they are shuffled about.

This fact suggests an important implication for our educational system: We need to evaluate and re-evaluate the appropriateness of techniques and curriculum in teaching math in Early Childhood Education. If arithmetic is imposed on a child before he has developed the necessary prenumber concepts, he will resort to memorizing and responding by rote. This inevitably leads to many frustrating experiences for the child when the "pat" answer does not fit. Indeed, the dislike and fear of math that is seen in many children between the ages of six and eight would seem a direct result of this frustration.

The development of a child's abilities to think and learn in logical patterns comes through experiences with physical objects. One can't emphasize strongly enough how important it is for parents and teachers of preschool and early childhood aged children to provide a wide variety of manipulative experiences and materials. Children gain understanding not from the objects, nor from what we tell them about the objects, but from their own actions on the objects. First-hand experience is the key!

Classification

Classification, according to Piaget, is a prenumber activity which provides a foundation for the child's true understanding of the concept of number. While both classification and seriation are based on the relationships between things, classification or sorting focuses on the similarities between objects and seriation or ordering on the differences between objects.

A child in the preoperational stage is just beginning to understand the process of classification or grouping and usually will focus on one attribute to classify objects. While he may use color, shape, or size to make his grouping, color is the easiest of these three attributes for a child to use, Classifying by color, then, is perhaps a good place to start for the early preoperational child. Start with pure color distinctions first, then work to the subtle gradations, using the exercises in this section.

Whether he chooses color, shape, or size as his means of classification, the preoperational child usually is able to focus on only one attribute to classify objects. This is called "centering." *For example, when a child of 4 years is asked to put things that are exactly the same in one pile, and has before him red and blue triangle blocks and red and blue square blocks, he will probably only differentiate a pile of red objects or a pile of blue objects.*

The preoperational child also finds the concept of "class inclusion" (One class of objects can be a subclass of another class of objects) difficult. The following classical Piagetian experiment illustrates this. *A 5 year old is shown a collection of wooden beads, of which 10 are blue and 5 are yellow. He agrees that all of the beads are wooden, but when asked whether there are as many, fewer, or the same number of blue beads, as wooden beads, he says there are more blue beads.* Piaget suggests that when a child is asked to consider the subclass (blue beads), this destroys

the larger class (wooden beads) for him at that moment. Another example which has probably warmed the hearts of many mothers: *When a 4 year old is asked, "In all this world, are there more women or more mommies?" he will most often answer "More mommies!"*

Besides being an important basis for later logic, classification skills have a creative side. A child who can hold up an object and think of several ways in which it would be classified has learned about flexible thinking and the important notion that there is more than one way to look at something!

Activities

- CHILDREN CAN CLASSIFY ALMOST ANYTHING IN THEIR ENVIRONMENT

- Have a tray of basic items and let them classify the items according to their own grouping. Ask them what it is.

- Have buttons of different sizes, colors, shapes, styles, number of holes. Have child sort by one attribute at a time, (an egg carton is an ideal place).

- Have child classify actual items for rough/smooth, wood/plastic/metal.

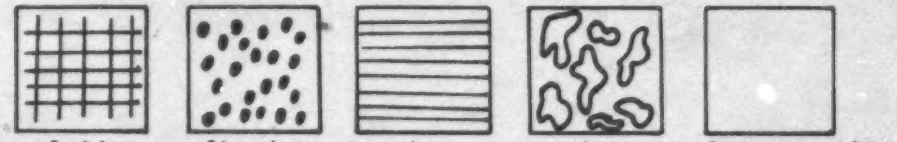
- Have pictures of things that are alive and not alive to classify (for older preoperational or early concrete stage).

- Classification game: 2 or more players: Have an array of basic items. Each child has to find 2 items with something in common (pen and pencil). They match them, state the commonality, and take from the tray until all items are gone.

- Attribute Blocks - can be classified by color, shape, size, thickness. (For child 5 yrs. plus, make challenge more advanced, *e.g., "Find something that is red and round.")*

- Float/Sink - have a variety of objects (some that will float, and some that will sink, *e.g., cork, penny, paper clip, pencil, ping pong ball, rubber band, ivory soap*). Do this activity at the water table, dishpan of water or even in the tub! Have child guess whether each item will float or sink. Then let child test each item in water and separate into "sink" or "float" on table.

- Fabric Match - cut scraps of fabric, mount on cards and have child match according to pattern.



- Many household tasks provide excellent and fun sorting experiences. When unloading groceries, let your child differentiate between things that go in the refrigerator and on the shelf. An older child can tell which are fruits, dairy products, etc.

- Sorting socks for Dad, putting together the two that belong, is fun, even for the young child. Setting the dinner table gives practice not only in sorting and classifying, but in one-to-one correspondence (which Piaget suggests cannot be taught, but must be learned by experience).

- Have a round "treasure hunt." Give your child a grocery bag and challenge him to find as many "round" things as he can (go on to find square, triangle, rectangle, blue, red, metal, wood, etc. things). Challenge him to a treasure hunt for things which are familiar and focus on one attribute. In the later preoperational stage (5-7 yrs.), you can make the directions even more difficult. "Find all the red square things you can." For rainy days or for a sick child this activity can be a "treasure hunt" through pictures in magazines (or the Sears' catalogue)!

- Have your child plan a round meal or a meal of different shapes, starting with a round paper plate, sandwich cut with donut cutter, cracker, grapes or orange slices, olives, round cookies, a round glass of milk, etc.

- For the late preoperational or early concrete operations stage (5-7 yrs.) try classification according to negative attributes. Have several items of different colors and shapes or basic items. Tell the child to put all the things that are not ____ (red, triangle, cars, soft, etc.) to one side.

Seriation

Seriation calls for arranging objects in a series according to some specific order, and differs from classification,in that a child is required to make groupings based on differences rather than on similarities. Because it is based on making a comparison, seriation is more difficult for children than classification where they have only to decide whether or not the object possesses the required characteristic, *e.g., is it blue?* Both seriation and classification are basic to an understanding of the relationships between objects. The preoperational child is just beginning to form this understanding; therefore, experiences with ordering objects by size, quantity, quality, etc., are helpful for cognitive development. These should be kept simple in order not to lead to frustration. In both seriation and classification activities, the child is moving from the perceptual reasons to the conceptual reasons of why things belong together as he moves from the preoperational stage to the concrete operations stage. He also must use more than one criteria in judging and must select and hold these criteria in mind. Seriation activities are, therefore, more advanced than classification activities, but serve an important role in the child's understanding of number concepts.

To illustrate, a child who is asked to string beads in the same order as one shown to him usually cannot do it if he is under 3 years of age. As he approaches 3 1/2 years, he can do it with very simple beads. Another common type of seriation would involve arranging a group of objects in order according to a certain characteristic, *e.g., size.* Piaget has found that children under 5 years usually succeed in constructing fragments of a series, isolated pairs here and there. Between 5 and 6 years, they can form the series by trial and error, picking an object at random and comparing it to another, then to another, etc. At about 7 years, a new technique emerges. They look for either the shortest or the tallest object, start with it, and systematically build up a whole series.

Activities

- Provide a corner in your kitchen with nesting objects, pots, pans, measuring spoons, cups, funnels of different sizes, lids or jars ranging in size, etc.

- Cooking provides wonderful experience in seriation or understanding of sequence of operations and events. "First you do this, then this..." Use one of the many cookbooks for children on the market with recipes in step-by-step picture form.

- (In the following activities, where appropriate for beginning seriation experiences, start with 3 items to seriate.)

  Sound series - have an array of sound cans on table. Have child arrange in order from softest to loudest, or lowest to highest, etc.

  Weight cans - do same as above with differently filled cans of sand and arrange in order from lightest to heaviest.

  Color - use paint chips and have child arrange gradations of color.

- Empty to full

  Collect 4 to 6 bottles of the same type and fill each with a different amount of colored water from empty to full. Have child arrange empty to full.

- Short to Long

  Cut several drinking straws or cardboard tubes of varying lengths. Have child order from short to tall, or short to long.

- Sequence of Events

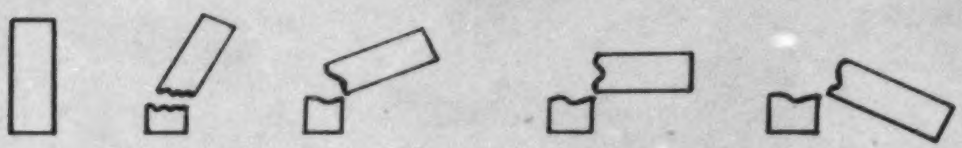
  Cut out pictures from magazines or books showing a sequence of events, i.e., sun setting, flower blooming, getting dressed, etc. Mount these and have child put in order. There are also manufactured sequence cards.

- Stacking Boxes

Very simple seriation that can be done with very young children is stacking boxes, one inside another. Collect boxes that fit one into another and give to child to put together.

- Telephone Pole Sequence

For the older preoperational child, copy the drawing of the telephone poles falling down below. Put each drawing on a separate card. Have the child put in order from upright to fallen down. If the child is having difficulty, stand a pencil on the table and slowly tip it while the child watches.



Conservation

Conservation is one of the key concepts in Piaget's theory and has great implications for education. For instance, as we said earlier, a pre-operational child often thinks the length of an object changes when it is moved to a different position. It is appropriate, then, to teach measurement in the Kindergarten - first grade, if the child thinks that a ruler or yardstick changes length if it, in fact, presents a different appearance.

Piaget suggests that understanding of conservation hinges on the development of the concept of reversibility. That is, in the reality of thought, for every action, there is another action that undoes it. The milk can be poured back into the tall glass; the clay rolled back into a ball. But at the preoperational stage, the child cannot visualize such reversals.

Understanding the concept of conservation is indeed a very difficult task for the child and does not develop until Concrete Operations (between 7-11 yrs.). Conservation means that the child understands that things remain the same if nothing is added or subtracted, but only the appearance is changed. Piaget's observations suggest that conservation of length comes first, then liquid, substance, width, and volume, in that order.

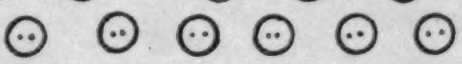
Activities

- Conservation of length

Make two lines (rows) of 6 buttons each and ask the child if they have the same number of buttons.

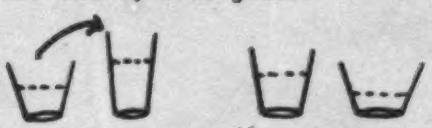
A child in preoperations will usually agree that the number is the same. However, spread one row out and he will usually respond that there are more in line "a" than in line "b." When asked "Why?", he will most likely say because the line is longer.

a.

b. 

- Conservation of liquid

Make this verbal and visual presentation to your child. (Assemble first a regular drinking glass with milk in it; a taller, thinner glass, and a shorter, wider glass.) "If I pour the milk in this drinking glass into this tall glass, will one have more milk for me to drink, or will they both have the same amount?" Return milk to original container and ask similar question. Repeat, pouring milk from original glass into short, wide glass.



a. b.

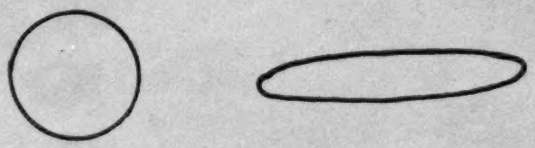
"Which glass has more milk for me to drink?"

A child in preoperations will usually say one or the other has more milk now, depending on which attribute he is focusing.

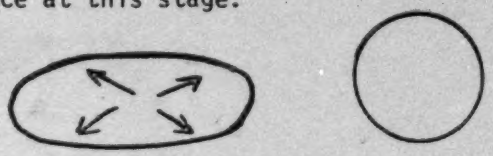
- Conservation of substance

Present two balls of playdough to your child as closely matched in size, weight, and shape as you can make them. Let him feel them until he agrees they are the same. While he watches, roll one of the balls into a sausage shape, leaving the other as a ball. Ask, "Does one have more playdough now, or do they both have the same amount?"

The preoperational child will usually say the sausage has more playdough. Some children focus on the ball as having more weight over a smaller area and, therefore, say it has more playdough now, even though nothing has been done to it!



Flattening one ball and leaving the other as a ball also produces different responses, but usually the preoperational child will respond that one or the other has more playdough now, even though none has been added, but because the shape is different. He does not understand conservation of substance at this stage.



Piaget suggests that this is a very normal stage of development and that even though a child could be "trained" to respond correctly to conservation concepts, it would serve no purpose and would not accelerate the child's cognitive development. The key here, as with other Piagetian tasks, would be to allow the child opportunities to manipulate, experiment, and to learn for himself by discovery. While true understanding of the concept of conservation cannot be taught, experiences and opportunities for experimenting and for questioning are helpful to the child so that he can learn new information.

V. PIAGET: IMPLICATIONS FOR YOU, THE PARENT AND TEACHER

Learning is an active process. As Piaget suggests, learning comes through "doing." It is hoped that this book will have provided you with some insights and ideas that you will want to experience with your child/children as he grows, develops and learns.

The theories of Piaget do indeed have some extremely significant implications for our educational settings. Understanding the preoperational child and how he thinks and learns demonstrates the importance of lesson planning from the child's point of view. Understanding the stages of cognitive growth and the fact that children learn at their own rates and through their own interests stresses the need for individualized education and learning or "discovering" centers. Understanding that a child learns by doing and experiencing on his own more effectively than by listening to explanations suggests strongly that the teacher's role should be that of a facilitator, rather than a dispenser of "knowledge." Understanding that there are some areas of knowledge which cannot be taught in the traditional sense, but must be learned through the child's own integration, stresses that parents and teachers must be creative, observant, and provide a wide variety of experiences and materials for the child to explore and act upon.

While the preschool through third grade years are extremely important, with respect to each child's cognitive growth and development, perhaps the most vital contribution we as parents and teachers can make to our children is to teach them <u>how</u> to learn rather than <u>what</u> to learn.

VI. GLOSSARY OF TERMS

Accommodation - The individual adjusts his response to meet the demands of the specific object or action he is trying to deal with. Accommodation is a process which reaches outward toward reality. (See Assimilation.)

When a child tries to balance one block on top of another, he must take into account the physical qualities (reality) of the blocks. When he wants to reach something in a cupboard, he may have to go through a series of actions, *e.g., getting a stool, climbing up, etc.*, in order to accommodate to the reality of "too high."

Animism - The child believes that the world of nature is alive and has a conscious purpose, as he does. Although these ideas are replaced by more scientific explanation as one grows older, adults often display this characteristic in their thinking.

The adult who smiles indulgently (or not) when a child says, "My new swing needs to come into my room because it will be lonely and cold outside," will later kick his car and get angry at it if it fails to start in the morning.

Artificialism - The child believes that human beings are the creators of natural phenomenon.

When asked why there is a moon at night, a child may reply, "They (the grown-ups) made it so I would know it's time to go to sleep."

Assimilation - The taking in of perceptions, actions, information, etc., from the environment and the incorporation of them into the existing structures available within the individual. If these stimuli cannot be incorporated into existing structures, because of small variations, accommodation can occur. If they are too different from the existing structures and organizations, they will not be assimilated. (See Accommodation.)

Giving a child 2 years old a ball to roll may be a new experience and after a series of accommodations, he may roll it back and forth to you -- you would not expect him to challenge you to a tennis match.

Centering - A preoperational child focuses his attention (centers) on an attribute of a situation, ignoring others.

In the conservation of length experiment, when 2 sticks of equal length are presented, then one moved:

(1) *(2)*

the child centers on one end state, not the transformation, and will reply "one is longer because it goes out more."

The child de-centers through social interactions, especially those involving arguments which force him to take notice of other viewpoints.

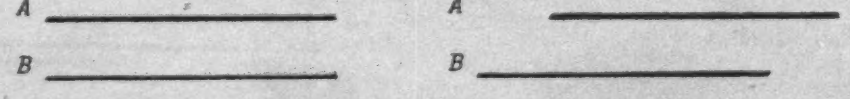
Cognitive Conflict - A period of disequilibrium when new information is not in agreement with what is "known." The child must reorganize his structures in order to accommodate to this new information and restore internal balance. This reorganization results in higher level thinking or mental growth.

A child confronted by the information that 2 big nickels are just the same to the man at the store as 1 little dime may experience cognitive conflict or disequilibrium until he can reorganize his structures to accept this equivalence.

Concrete Operational Stage - The period of development covering approximately the 7 - 11 age range. This stage is characterized by a differentiation of appearance and reality, the ability to internalize actions, and use rules in his thinking. It is termed "concrete" because his operations (mental actions) are still tied to concrete objects.

Conservation - The ability to understand that quantities of objects continue to have the same amount of length, volume, etc., if nothing is added or taken away; only the form has changed.

Two twelve inch rulers are still the same length, even after one has been displaced to the right or left. A preoperational child will focus on the ends of the ruler and state that "A is longer now."



Construction of Reality - The child does not passively record experience and input from the physical environment as if his mind was film in a camera or a blank page on which one could objectively write knowledge of the physical world. The child actively constructs his ideas of what the world is like, according to his level of development and his experiences. As he moves through higher stages of development, he continually reconstructs his ideas of what "reality" is so that they become more objective. Although the child assimilates information, it is assimilated to his mental structures as they are at the time. His structures will accommodate (change) in order to process the new information, but they can only accommodate to slightly novel information.

For example, a baby constructs his picture of reality that rattles and little toys are interesting to put in his mouth. When given a ball, he will try to suck it and will have to accommodate to his response to take into account its shape. He will not be able to perceive it as an example of a sphere or a round rubber object. These ideas are not a part of his reality.

Dequilibrium - See Cognitive Conflict, Equilibration

Egocentric - The lack of awareness of points of view other than the child's own. Although the content changes, egocentrism is characteristic throughout development: (1) In the Sensori-Motor stage the infant does not realize that things continue to exist outside his perception; (2) In the Preoperational Stage a child feels that not only other people, but even nature sees things from his point of view; (3) In the Concrete Operational Stage he is able to understand the point of view of others but only others who are similar to himself; and (4) In the Formal Stage the adolescent may feel that everyone is aware and focused on this or that secret "personal defect" because he is aware of it and it is the focus of his attention.

Equilibration - The process of bringing maturation, experience, and interaction together to build mental structures or systems for considering, understanding and ordering the world. The balancing of assimilation and accommodation. (See Accommodation, Assimilation, Cognitive Conflict.)

Formal Operational Stage - The period of development from age 11 on. This stage is characterized by the ability to differentiate form from content, (hypothesis testing), to think about thought without being tied to concrete objects and reality. Reality may become secondary to possibility. Don't assume all children over 11 or 12 are in the formal operational stage -- most adult thought is characteristic of the concrete operational stage and and approximately one-half the population never reach the formal operational level of thinking. (Kajan, 1967)

Imitation - This is primarily based on the child's attempts to accommodate to what he has observed, whether he understands it or nor.

For example, when a child takes on the role of mother or father in doll corner, he may verbalize in quite a grown-up way, but similar statements may not be forthcoming in other situations because they are imitated and have not been assimilated. (See Accommodation, Play.)

Intuitive Sub-stage - The later half (approximate ages 4-7) of the Pre-operational Stage of development. This stage is the major area of focus in this book. Thought is dominated by perception, concreteness, irreversibility, centering, and transductive reasoning.

Irreversibility - (See Reversibility)

Logico-Mathematical - Experiences dealing with objects and relationships lead to the development of logical and mathematical thought. These are learned through the child's actions (both mental and physical) on objects.

Ask a preoperational child: "In all the world is there more furniture or beds?" and he is likely to say, "Beds, because I have one." A slightly older child may answer your question, "That's too silly -- furniture of course!"

Ludic Symbolism - Symbolic Play - Use of one item to represent another, *e.g., rocks are candy to be passed to all, mudpies are cakes to be served at a "tea party," blocks are cars to run on a track."*

Object Permanence - The differentiation in the sensori-motor stage of development that objects and other people continue to exist outside the infant's perception and have a reality or permanence of their own. When the infant plays "peek-a-boo" his delight is evidenced because you are still there when he uncovers his eyes and didn't "cease to exist."

Operations - Actions carried out mentally, rather than physically. "If I put this carton of milk in that glass, it won't all fit, so I'd better get a larger glass." versus "The glass didn't hold all the milk, Mommy!" "The rest is on the floor."

Overdifferentiation - The child's inability to see similarities and make appropriate generalizations to members of a class.

"That isn't a cat, that's my Kitty, Fluff." "I'm not a little girl, I'm Julie."

Overgeneralization - The child's inability to differentiate between the general and the specific, between the class individual and the member of the class.

Have you ever wondered why a toddler accepts Santa Claus on every corner and in all the stores so matter-of-factly? When he begins to form true concepts, he must accommodate and may: (1) Reject Santa Claus; or (2) Say that the individuals he sees are "helpers."

Perceptual Constancy - The development of the ability to perceive that things are the same even when seen from different perspectives or in different settings.

"After my blanket is dry, will it still be a blanket?"

"When the baby gets dressed, will it be Sally again?"

Play - Play is primarily assimilation. No attempt at accommodating to reality is necessary. A small staircase can become a mountain; a large cardboard box, a secret jungle hide-away; a towel tied on his shoulders can mean an instant "Batman." (See Assimilation, Imitation.)

Preconceptual Substage - The first part (ages 2-4) of the Preoperational Stage of development. The focus of this substage is the emergence of language. It is called "preconceptual" because the concepts formed are not true concepts. (See Overdifferentiation, Overgeneralization.)

Preoperational Stage - The stage of development from approximately ages 2-7, encompassing the intuitive and preconceptual substages. "Preoperational" because the child cannot yet mentally manipulate objects, but relies on physical action.

Reversibility - The ability of the concrete operational child to understand that any change of position, shape, order, etc., can be mentally reversed, i.e., returned to its original shape, position, order, or number.

"If I add 3 and 2 to make 5, then I can take 2 away from 5 and make 3 again."

Sensori-Motor Stage - The stage from birth to age 2 when the child differentiates himself from objects and others and develops from the child's physical interactions with the world. He learns through his senses and motor activity.

Spatio-temporal - The understanding of objects and relationships within the contexts of space and time. These are learned through the child's experiences. Ask a preoperational child if the hour between 12 and 1 is shorter in the day or night, or are they the same? He might answer, "Shorter in the day because I'm awake."

A preoperational child when presented with 4 toy houses placed an equal distance apart, but with a tree between 2 of them, will say that "House 3 and 4 are closer together," as if distance equalled empty space.

Other concepts which are involved include age, i.e., bigger = older and movement and speed. First to finish is fastest, regardless of path or starting point.

Transductive Reasoning - Reasoning from particular to particular to explain events rather than using inductive or deductive logic.

"I fell down because I broke my arm."

"I am Italian now because I ate pizza."

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